

Vanessa L. Jones<sup>1</sup>, Mykaylee A. Wilhite<sup>1</sup>, Ian Robertson<sup>2</sup>, Timothy D. Sears<sup>1</sup>, Nicholas J. Kelling<sup>3</sup>, Ryan Z. Amick<sup>2</sup>  
GeoLogics<sup>1</sup>, KBR<sup>2</sup>, University of Houston-Clear Lake<sup>3</sup>

## Can virtual reality (VR) be used to conduct a habitat usability assessment?

Traditionally habitat evaluations are conducted with physical mockups of the environment and task.

- Potential benefits of VR include reduced costs for prototyping and faster iterative design based on feedback.
- Currently, it is unclear if task performance in VR can be considered equivalent to the same task as performed in physical reality (PR).

**30 participants performed a stowage task in the same “habitat” in two different modalities.**

### Physical Reality (PR)

Participants started with three bins of 30 unsorted boxes.



Boxes came in three different sizes. Each box was labeled with its target storage area.



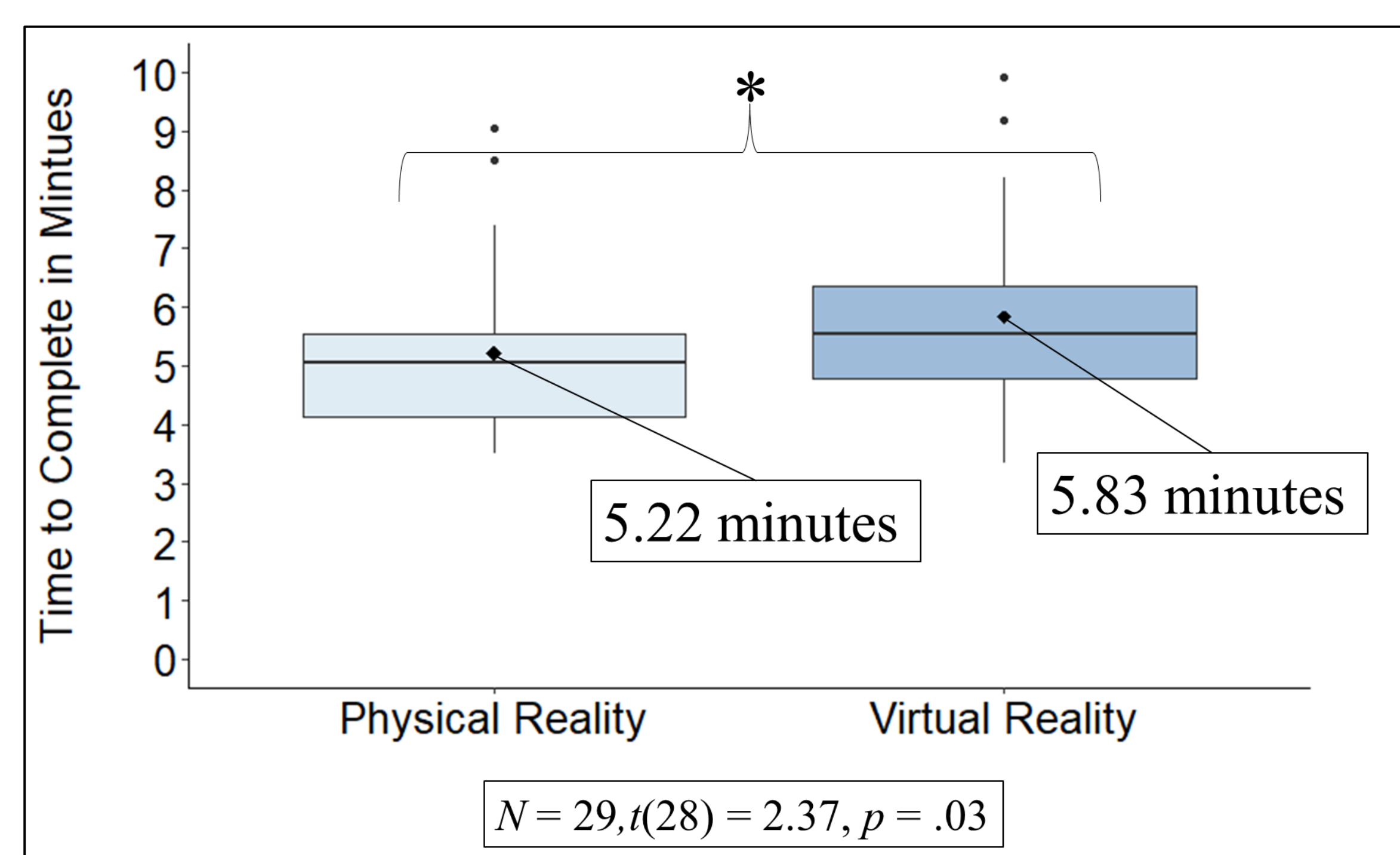
Storage areas were labeled to indicate what boxes should be stored within.



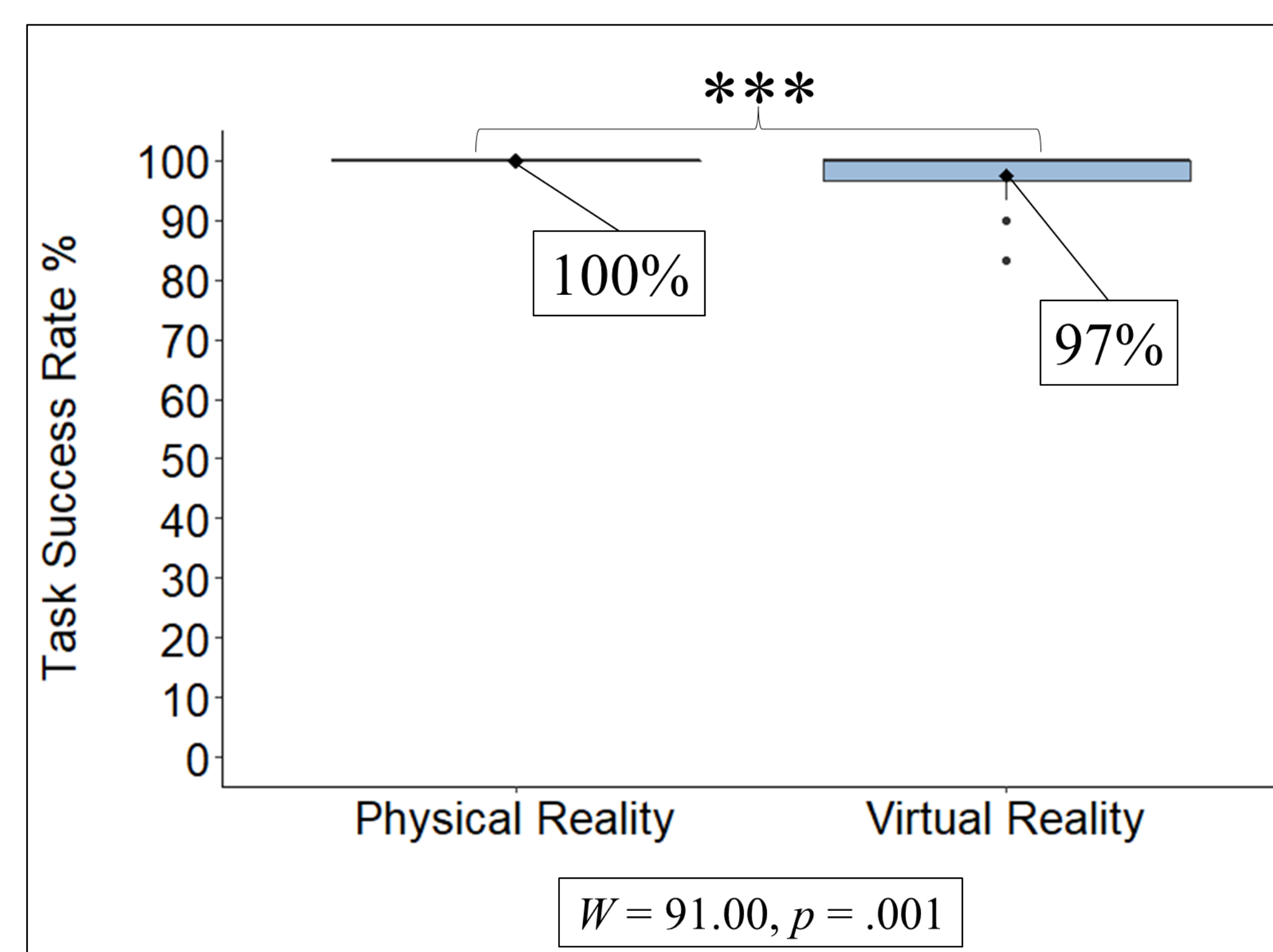
### Virtual Reality (VR)



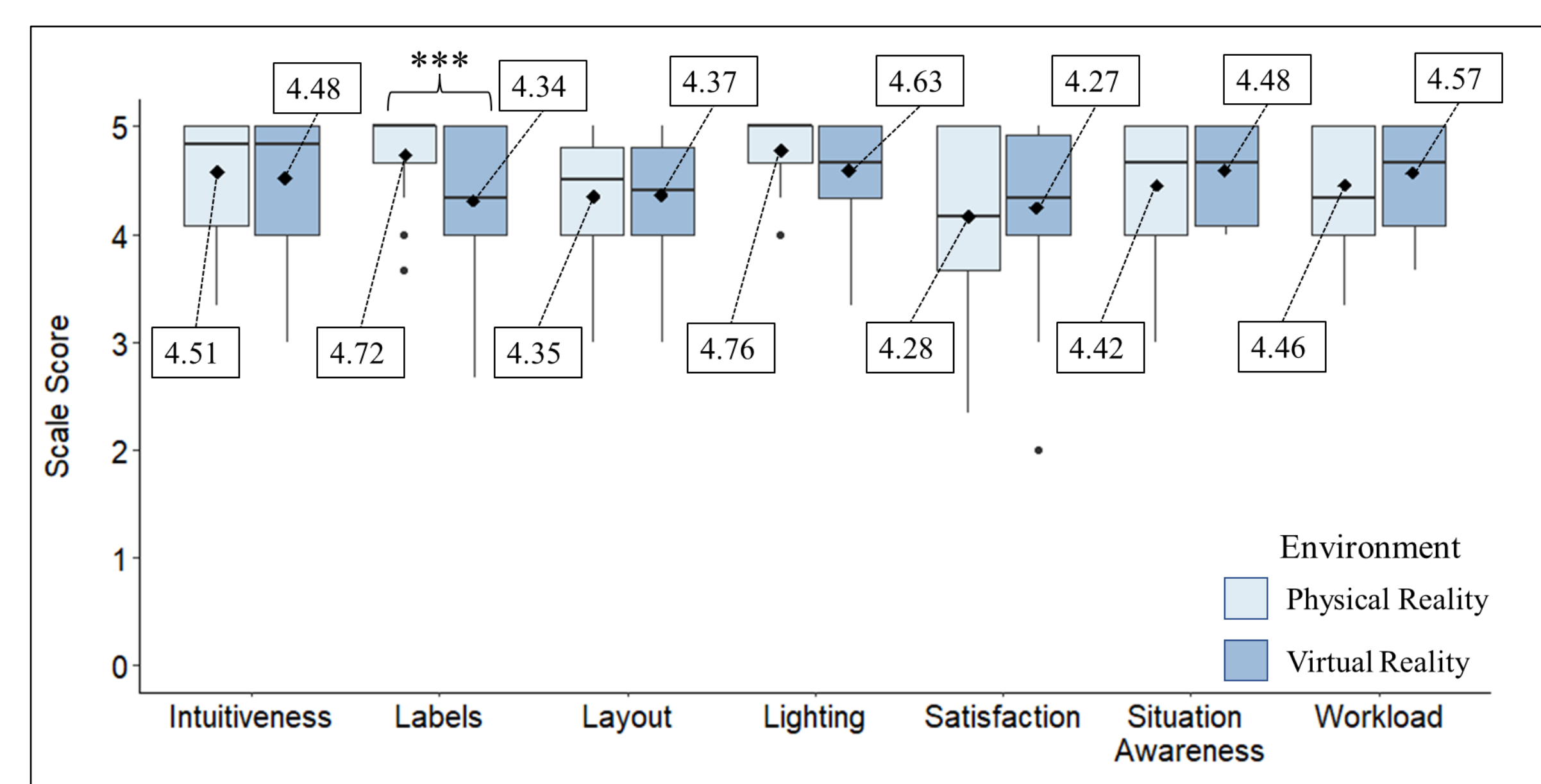
**Participants were faster to complete the task in the PR environment than in the VR environment by 0.61 minutes or about 37 seconds.**



**Participants made no errors (100% success) in PR and made a few errors (97% success) in VR.**



**There was a statistically significant difference between the mean ratings of the PR and VR environments on the Labels subscale of the Scale for Habitat Usability.**



## VR Experience

- Participants rated the VR environment as being very similar to the PR environment ( $M = 6.17$ ).
- Participants ratings indicated that they felt “present” in the VR environment ( $M = 85.62$ ).
- Most participants ( $n = 18$ ) reported no problems with sickness during the VR task, but many ( $n = 11$ ) still reported some discomfort sans nausea.

**We asked participants to “Please name two to three differences you noticed between the virtual and physical environments.”**

- Opening/closing stowage was unnatural in VR.
- VR boxes acting abnormally (floating, going through objects, etc.) .
- Differences in physical effort.
- Labeling/legibility was better in PR.
- Real life provided better feedback to user.

**We asked participants regarding the differences they observed: “Do you think they affected your performance or experiences?”**

- Most participants felt that the differences between PR and VR affected task performance in some way.
- Some participants felt the differences they observed did not impact performance.
- Some participants reported the tutorial helped them perform in VR.

## Summary and Future Directions

- VR increased time on task and errors committed.
  - Evaluators using VR need to be certain performance decrements are due to design and not limitations of VR.
- VR may be acceptable for group level subjective ratings of built environments.
  - More work needed to establish equivalency.